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CANADA

DEPARTMENT OF MINES

MINES BRANCH

HON. W. TEMPLEMAN, MINISTER; A. P. LOW, LL.D., DEPUTY MINISTER;
EUGENE HAANEL, PH.D., DIRECTOR.

BULLETIN No. 2

IRON ORE DEPOSITS

OF THE

BRISTOL MINE, PONTIAC COUNTY, QUE.

MAGNETOMETRIC SURVEY, ETC.,

BY

E. LINDEMAN, M.E.

MAGNETIC CONCENTRATION OF ORES

BY

GEO. C. MACKENZIE, B.Sc.

OTTAWA
GOVERNMENT PRINTING BUREAU
1910

No. 2

2226

Frontispiece.

PLATE I.

Bristol Mine, Pontiac C[illegible]y, Que., 1894.

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INTRODUCTORY.

If a successful iron and steel industry is to be established in the vicinity of strategic water-powers, it is necessary that iron ores in commercial quantity, capable of being mined economically, and transported cheaply, should be available.

A pessimistic report having been circulated, to the effect that there are no iron ore deposits of magnitude in the vicinage of Ottawa, or, near Chats falls—which is situated between Lac des Chats and Lake Deschenes, at a point about twenty-six miles west of the city of Ottawa—and this negative report having hindered the erection of a large electric smelting plant in the neighbourhood of Chats falls, the Mines Branch was importuned to systematically examine the best known iron ore field in the district, namely, the Bristol mine. At the earliest moment an investigation was made, and the data contained in the following bulletin is the result of a magnetometric survey of the deposits embraced within the limits of the mine in question; together with analyses, and magnetic concentration tests of the ores.

The importance of magnetometric surveying has once again been demonstrated; for Mr. Lindeman's survey has revealed the occurrence of an ore field of 90,000 square feet, the existence of which was practically unknown. And while the general conclusions deduced from the evidence gathered are conservatively stated; the fact that one brief examination has shown the mine to be much richer in commercial ores of good quality than was anticipated, added to the reasons which the author sets forth, accounting for the unprofitable working of the mine during the latter part of last century, entitles those interested in the development of an iron and steel industry in Pontiac county, Quebec, to view the outlook from an optimistic standpoint.

(Signed) EUGENE HAANEL,
Director of Mines,
Department of Mines.

PLATE II.

Bristol Mine, Pontiac County, Que., 1894.

ON THE IRON ORE DEPOSITS

OF THE

BRISTOL MINE, PONTIAC COUNTY, QUEBEC.

BY

E. LINDEMAN, M.E.

INTRODUCTION.

In view of the proposed erection of an electric smelting plant at the Chats falls—situated on the Ottawa river, between Lac des Chats and Lake Deschenes, about twenty-six miles west of the city of Ottawa—the writer received instructions in July, 1909, to make an investigation of the Bristol iron mine, in order to ascertain its capabilities of continuously supplying ore for such a smelter.

The first work dates back to the winter of 1872-3, when the north halves of topographical surveys were made of the mine and its neighbourhood. A magnetometric map has been prepared on a scale of 200 feet to one inch showing the vertical intensity of the different ore bodies, the outcrops of iron ore, and associated rocks. By means of magnetic observations the areas of the different ore bodies have been approximately indicated on the topographical map of the mine, which has been prepared on a scale of 200 feet to one inch, also, with contour intervals of 5 feet.

Location of the Mine.

The mine is situated on the north half of lot 21, range II, in the township of Bristol, county of Pontiac, Quebec, at a distance of about 4·8 miles northwest of Chats falls. A standard gauge railway—now in a state of decay—connects the mine with Wyman station: on the Ottawa-Waltham branch line of the Canadian Pacific railway: the distance from the mine to Wyman station being four and a quarter miles.

History of the Bristol Mine.

The writer is indebted to Mr. John Kilroy, owner of the north half of the adjoining lot 22, for the following facts relating to the history of the mine.

The first work dates back to the winter of 1872-3, when the north halves ot lots 21 and 22 were leased to an American syndicate and some openings made; but no ore was shipped, and after some years the lease was allowed to expire. In 1883 the properties were leased to another syndicate, and mining operations started in the autumn of 1884. These operations, however, were confined to lot 21, and chiefly in Shaft No. 1. A compressor and hoisting plant were installed, and necessary shops erected. Inasmuch as the ore contained considerable iron pyrites, two roasting kilns with six gas producers were built, and the ore crushed and roasted before shipment. Operations were carried on, with several interruptions, until 1894, when the mine was closed down. Since that time no attempt has been made to re-open it, and at present all the workings are filled with water.

General Geological Features.

Geologically, the area presents a series of Keewatin schists and gneisses, associated with crystalline limestone and intruded by granites.

The magnetite deposits occur in irregular beds and pockets, interstratified with hornblende, calcareous mica, and chlorite schists. These schists are overlaid by highly siliceous mica schists, which are followed by gneiss. The strike of these stratified rocks varies from N 70° W to N 42° W, with a dip towards the north varying from 89° to 35°. The ore bodies, as well as the schists and gneisses, are frequently cut by basic granites, which often show a strong pegmatitic structure.

Character of Ore.

The ore consists of magnetite, which in some parts of the field contains a considerable amount of hematite.

Associated with the magnetite are hornblendic, micaceous, and cholritic materials, which are found distributed through the magnetite, as well as interbanded with it; while in places, a complete gradation seems to exist between the magnetite and these associated gangue minerals. Iron pyrites is frequently seen disseminated in small patches through the ore.

As the few available outcrops are too weathered and rusty to afford any reliable information in regard to the quality of the ore, average samples were taken from five of the largest ore piles of the mine, the weight of each sample being about 100 pounds. The analysis of these samples have been made by H. Leverin, Ch.E., of the Mines Branch, and are as follows:—

Constituent.	*1	*2	*3	*4	*5
Ferric oxide ~~of iron~~	51·71	63·880	42·30	52·31	52·55
Ferrous oxide ~~of iron~~	25·33	9·640	22·31	22·95	25·84
Bisulphide of iron.	3·32	4·530	5·48	2·83	2·76
Protoxide of manganese		0·120			
Alumina.		0·680			
Lime.	1·32	5·700	3·30	3·50	1·27
Magnesia		1·200			
Silica.	10·11	6·670	8·17	8·15	9·47
Phosphoric acid.		0·006			
Titanic acid		0·220			
Water		0·360			
Carbonic acid, and undetermined		6·994			
		← 100·000.			
Metallic iron.	57·230	54·350	53·740	55·720	58·180
Sulphur	1·780	2·410	2·920	1·510	1·480
Phosphorus	0·001	0·003	0·007	0·006	0·008

* Samples 1 and 5 represent ore from Shaft No. 1.
Sample 2 represents ore from Pit No. 2.
" 3 " " 3.

The five analyses show metallic iron contents ranging from 53·74 to 58·18 per cent, or an average of 55·84 per cent. The phosphorus content is very small, averaging 0·005; the sulphur is high, varying from 2·92 to 1·48 per cent, while the titanium is inconsiderable in amount.

Extent of Ore Bodies.

Inasmuch as all the old workings are filled with water, and the outcrops of ore very few, it is manifest that no definite statement with regard to the magnitude of the different ore bodies can be made: by magnetometric surveying, however, it has been possible to locate the different ore bodies, and from the map to make an approximate estimate of their respective areas.

As already stated, the principal mining operations have been confined to Shaft No. 1. The dip of the shaft, as evidenced by the inclination of the skip road, is to the south, and the depth is said to be 200 feet.

Drifts were said to have been driven in different directions, and the mine worked by three levels.

No plan of the working is available, and no reliable data with regard to the quantity of ore mined could be obtained.

Near the shaft a large amount of ore has been piled. The ore is, however, considerably mixed with gangue minerals, and will need a thorough cobbing before shipment. About 60 feet east of the shaft, and close to the roasting plant, Pit No. 1 has been sunk. The pit is filled with water; but east of it a stripping 40 feet × 18 feet exposes an ore body. Judging from the magnetic observations, this body has a length of about 150 feet, and seems to extend under the roasting plant. South of this ore body another deposit is situated—partly underlying the engine house. On account of the large ore pile situated between and over these two ore bodies, and which, undoubtedly, has a considerable influence on the magnetic observations, it is difficult to state their approximate area. They may, however, taken altogether, not exceed 25,000 square feet.

Numerous other deposits occur round Shaft No. 1, within a radius of about 400 feet; but they are all of small extent, and none of them are likely to be of economic importance.

About 500 feet southeast of Shaft No. 1, Pit 2 has been sunk~~, and~~ some good magnetite is visible on its south wall. This pit is said to have a depth of 30 feet, and to have yielded a good clean ore.

Judging from the magnetic observations, the pit has been sunk on the west border of a deposit, the approximate area of which is estimated to be about 60,000 square feet. South of the pit this deposit has been exposed by a few strippings. These exposures show magnetite interbanded with layers of weathered hornblendic and micaceous rocks, which, in places, are cut by granite.

Pit No. 3 is situated about 300 feet southwest of Pit No. 2. It is reported to have a depth of 75 feet, and has been sunk on a small deposit of inconsiderable value.

Pit No. 4 is situated 600 feet southwest of Shaft No. 1. The magnetic observations here show several deposits, which are all covered by a heavy loam. The approximate areas of the two largest of these may be estimated at 12,000 and

11,000 square feet, respectively. On the latter deposit, Pit No. 4 has been sunk. Some ore is piled up at the mouth of the pit and seems to be of the same character as that found round Shaft No. 1. About 150 feet south of the pit some outcroppings of crystalline limestone are visible, the general trend of which is east and west.

Shaft No. 2 is situated about 600 feet northwest of Shaft No. 1. and is said to be 100 feet deep. From its bottom a drift is said to have been driven 100 feet in a westerly direction, when ore was met with.

No outcrops of ore, nor any ore piles are visible around the shaft, and magnetometric observations do not indicate the presence of any ore body of importance. The waste dump consists mostly of chloritic material, in which magnetite occasionally appears as little seams and patches. From Shaft No. 2 the iron-bearing formation was traced by its magnetic property in a westerly direction for a distance of about 1,000 feet, extending into the adjacent lot 20. No ore body of any importance was discovered, however, and the magnetic field seems to indicate that the formation is disseminated with some magnetite, which occasionally concentrates into small ore pockets.

On lot 22—east of lot 21, a few outcrops and float of magnetite have been found in ploughing the field. Unfortunately no prospecting has, so far, taken place on this property, although occurrence of magnetite has been known for many years. The present investigation shows that this lot probably contains the most important deposit of the series. Thus the magnetic observations indicate a deposit a short distance east of the boundary line between lots 21 and 22, the area of which might approximately be estimated at about 90,000 square feet. It is bounded on the west side by granite, which very likely cut it off from the iron-bearing strata of lot 21. South and east of this deposit several others of small extent occur. On the adjoining lot 23, and also on lots 24 and 25, outcrops of schistose rocks were found; but no magnetic indications of any ore body of importance could be noticed.

Conclusions.

Reviewing the results obtained by the investigation, the conclusions arrived at may be stated as follows:—

The magnetite occurs in parallel beds and lenticular shaped bodies along the stratification of hornblendic and micaceous schists. The association of the magnetite and these gangue minerals seems to be very intimate; and in places, complete gradations exist between masses of magnetite and these rocks. Numerous intrusions of granite in the iron-bearing strata seem also to have had an important bearing on the horizontal extent of the deposits as well as on their depth, cutting them into irregular masses, and rendering their extent in depth uncertain. To judge from the irregular magnetic curves, and the numerous exposures of granite this state of affairs seems to exist round Shaft No. 1.

It is manifest that the unprofitable mining operations carried on some years ago were largely due to the irregularities of these ore bodies; to primitive methods of working; and to the long railway haul from the mine to Pennsylvania, U.S.A., where the ore is reported to have been shipped.

On the other hand, the present investigation indicates that lot 22, and the east part of lot 21 contain some promising deposits. The most important of these is that on lot 22; the approximate area of which has been estimated at 90,000 square feet. As this deposit is practically all covered by a heavy loam, and taking into consideration the intimate association of the magnetite with the schistose rocks in other parts of the field, it is evident that no definite statement can be made with regard to the tonnage of iron ore in this deposit; but as far as it is now possible to judge from the strong, even, magnetic attraction, there is every reason to conclude that the deposit is of considerable magnitude. In order to ascertain the precise character and quantity of these ore reserves, systematic development in the form of diamond drilling will be necessary.

ON THE MAGNETIC CONCENTRATION OF BRISTOL ORES

BY

GEO. C. MACKENZIE, B.Sc.

Shipment No. 1.—This sample was taken from the mine dump at Shaft No. 1. In selecting the sample larger pieces of rock matter were cobbed out; but no attempt was made to select pieces of ore free from pyrites, as it was intended to show that the subsequent separation process would eliminate the sulphides to a considerable extent. The ore consists of fairly coarse-grained magnetite in a gangue of feldspar, hornblende quartz, and calcite. Iron pyrites is present in considerable quantity, not finely disseminated, but occurring in stringers and nodular masses throughout the matrix.

Shipment No. 2.—This sample was taken from a small dump, the ore being mined some years ago, from Pit No. 2, situated 550 feet southeast of Shaft No. 1. Considerable picking over had to be resorted to in order to obtain pieces of ore that are free from oxidation; and although much cobbing was done, the sample selected cannot be regarded as representative of the ore as originally mined.

This ore differs radically from Shipment No. 1 in that it contains a marked proportion of hematite No doubt a portion of this hematite has resulted from the oxidation of the pyrite: but the fact that hematite is an original constituent is clearly illustrated by examination of freshly broken specimens; and many of the specimens exhibit the characteristic red streak of the peroxide of iron. The crystallization of this ore is finer than that of Shipment No. 1; and the gangue—consisting for the most part of calcite, feldspar, and pyrite—is intimately associated with the particles of magnetite and hematite.

Both samples were bagged and freighted to Kingston, Ontario, the separation tests being carried out in the mining laboratory of Queens University.

Preparatory Treatment of the Ore for Separation.

The ores were first broken to ¾ inch in a Blake crusher, and thence fed to Cornish rolls, crushing to ⅛ inch; the discharge from the rolls passing over a 6 mesh impact screen; oversize being returned to the rolls until all of the ore had been reduced to ⅛ inch.

After crushing, the ores were pil[illegible] on a sheet-iron floor and carefully sampled by the split shovel method, these samples representing the ores as received were marked general samples 'A.'

ANALYSES OF GENERAL SAMPLES 'A'.

Description.	Ferrous Oxide.	Ferric Oxide.	Insoluble.	Sulphur.	Phosphorus.	Iron.
Shipment No. 1......	23·65	50·14	17·46	2·62	0 011	53·49
" " 2.	9·51	63·47	9·97	2·79	0·008	51·83

Each shipment was then divided into approximately two equal parts; one-half of the ore being tested by the ordinary dry separation process, the remaining half being tested by the Gröndal wet process. This division of the ore was accomplished by taking alternate shovelsful from a coned pile, thus ensuring that each portion would be fairly represented by the general sample 'A.'

The portion taken for dry separation was then sized over impact screens: the object of this sizing process being to assemble particles of the same size, irrespective of specific gravity; the effect of which is twofold, (1) an increased efficiency in the separation process, and (2) the subsequent separation of each size, independently: illustrating the maximum crushing required for the highest efficiency of separation. The sizing process yielded four products, (1) particles of 40 mesh and finer, (2) on 40 mesh and through 20 mesh, (3) on 20 mesh and through 10 mesh, and (4) on 10 and through 6 mesh. Each of the above sized products was then sampled by the split shovel; the samples being marked Nos. 1, 2, 3, and 4 for the 40, 20, 10, and 6 mesh sizes, respectively. A summation of the analyses of these four sizes should approximate with the analysis of the general sample 'A': thus affording a check upon the whole.

Each of these sized portions of the original crude were then separated independently by the Ball and Norton belt magnetic separator, the concentrates and tailings in each operation being caught in suitable receptacles, and weighed; the dust loss being obtained by the difference in weight of the crude, and the weight of the concentrates, plus tailings. After weighing, the concentrates and tailings were carefully sampled for subsequent analysis.

The remaining half of the shipment reserved for wet separation was then split into three portions. The first portion being ground in a Krupp dry ball mill to a fineness of 10 mesh; the second to a fineness of 20 mesh; and the third to a fineness of 40 mesh. Sampling of these pulverized materials was not considered necessary, as they were each a portion of the original crude, and, therefore, represented by the general sample A.

The three portions were then separated independently by the Gröndal magnetic separator, the concentrates and tailings being caught in settling tanks; and after drawing off the surplus water, were dried and weighed. The slime loss in each case was obtained by the difference in weight of the original crude, and the weight of the concentrates, plus tailings. Concentrates and tailings were then carefully sampled for subsequent analysis.

Results of Separation.

The complete results of the separation processes—both dry and wet—for Shipments No. 1 and No. 2 are given in the accompanying tables. These tables show the analysis of the original crude, and the sized crude; also the weight and percentages of concentrates and tailings, with analyses; and the percentages of recovery and loss for each process.

Shipment No. 1.—This ore yielded exceptionally good results, as would be expected from its analysis and physical structure. In the dry process, over 70 per cent of the sulphur in the original crude was eliminated. Phosphorus, although below the Bessemer limit in the crude, was depressed in the concentrates to a point that should make these concentrates valuable for the production of special low phosphorus iron. The total loss in iron—3·54 per cent of that contained in the original crude—is very satisfactory, and affords a low ratio of concentration: being only 1·211; a figure of some importance if mining costs should happen to be above the normal.

The results obtained with wet separation, as regards the purity of the concentrates, are better than the results of dry separation; the reduction of sulphur by this method being over 90 per cent, with phosphorus reduced to practically a trace. The total loss in iron is hardly 2 per cent; the ratio of concentrates in this case being 1·3: a little higher than the dry separation ratio, owing to the higher iron content of the heads.

Shipment No. 2.—Concentration of this ore yielded results that are much inferior to those obtained from No. 1 Shipment. This difference is due almost entirely to the large proportion of hematite contained in the ore. The iron existing as the non-magnetic peroxide, was, of course, unaffected by the tractive force of the magnets, and consequently entered the tailings, constituting a heavy loss. The concentrates obtained by both dry and wet methods, although satisfactory as regards depression of sulphur, and phosphorus, are not as high in iron as the concentrates produced from No. 1 shipment. This may be accounted for by the fact that comminution was carried hardly far enough to completely free the constituent minerals, and, therefore, particles consisting partly of magnetite, hematite, and siliceous gangue were drawn into the heads, together with the cleaner particles of magnetite. To remedy this, and to produce a concentrate of higher iron content, would necessitate finer crushing; but as the subsequent separation would undoubtedly result in a further loss of iron, it would seem advisable to place the point to which comminution should be carried, with definite relation to the loss of iron incurred: the maximum loss of iron allowable being fixed by the mining costs of the crude and the value of the concentrated product.

Briquetting or Nodulizing.

The concentrates produced from the Bristol ores will, without doubt, be too finely divided for direct use in either the blast furnace or the modern electric shaft furnace. They will, therefore, require agglutinizing before they can be smelted economically. This agglutination or sintering of the fine material may be accomplished by either one of two methods: (1) briquetting by the Gröndal system in which the moist concentrates are pressed into briquettes without the addition of any added binder, and subsequently oxidized and sintered into firm porous briquettes, in long gas fired furnaces of rectangular section: (2) by the nodulizing process, in which the concentrates are fed into the upper end of an inclined rotating tubular kiln: the kiln being fired by blowing in coal dust at its lower or discharge end. The concentrates are first sintered into masses by the intense heat, and then broken up into nodules by the rotating movement of the kiln, and discharged at the lower end. These nodules are of varying dimensions, from egg to pea size, and more or less peroxidized.

By either of the above briefly described methods, the concentrates from Bristol ores would yield very desirable low sulphur material for the manufacture of iron by either the electric furnace or ordinary blast furnace.

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MAGNETIC CONCENTRATIO

1836 POUNDS TO DRY TEST ←

DRY CONCENTRATION.

Sample Number.	Through Mesh.	Crude Ore Sized.						Concentrates.						Tailings.				Dust Loss.		Efficiency.		
		Weight and Per cent.		Analyses.				Weight and Per cent.		Analyses.				Weight and Per cent.		Analyses.				Per cent of Iron Saved	Per cent of Iron Lost.	Units of de pe Unit of Concen-trate.
		Pounds.	Per cent.	Iron, per cent.	Insoluble, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Pounds.	Per cent.	Iron, per cent.	Insoluble, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Pounds.	Per cent.	Iron, per cent.	Insoluble, per cent.	Pounds.	Per cent.			
1	40	714	38·85	55·70	16·32	2·25	0·009	536	78·15	60·12	2·59	0·202	0·0008	141	19·74	7·81	70·88	15	2·11	96·95	3·05	1·280
2	20	355	19·35	58·43	12·00	2·28	0·016	296	83·38	68·23	3·43	0·341	0·0007	52	14·64	9·63	66·79	7	1·98	97·31	2·69	1·200
3	10	378	20·60	51·44	17·89	3·00	0·012	313	82·80	59·41	12·43	1·403	0·0020	61	16·13	12·64	64·75	4	1·07	95·93	4·07	1·204
4	6	389	21·20	47·51	26·03	3·06	0·014	349	89·71	51·00	22·43	2·560	0·0010	37	9·51	17·23	63·67	3	0·78	96·71	3·29	1·112
Totals		1,836	100·00	52·73	18·06	2·57	0·012	1,516	82·57	62·77	8·95	1·010	0·0010	291	15·84	10·34	67·94	29	1·59	96·71	3·29	1·208

RECAPITULATION FOR TOTALS.

Pounds iron in crude, 986·48.

" concentrate	951·59
" tailings	30·08
" dust	4·81
Totals	986·48

Per cent saved in concentrate	96·46
" lost in tailings	3·04
" lost in dust	0·50
Totals	100·00

Units of crude required per unit of concentrate, 1·211.

FIG. 1

RATION, BRISTOL ORE, SHIPMENT No. 1

NCY.	
nt	Units of de per Jnit of Concentrate.
05	1·280
39	1·200
07	1·204
[illegible]	1·112
[illegible]	1·208

POUNDS TO WET TEST 1922

WET CONCENTRATION.

Crude Ore.							Concentrates.						Tailings.				Slime Loss.		Efficiency.		
Sample Number.	Ground to Mesh.	Weight in Pounds.	Analyses.				Weight and Per cent.		Analyses.				Weight and Per cent.		Analyses.				Per cent of Iron Saved.	Per cent of Iron Lost.	Units of Crude per Unit of Concentrates.
			Iron, per cent.	Insoluble, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Pounds.	Per cent.	Iron, per cent.	Insoluble, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Pounds.	Per cent.	Iron, per cent.	Insoluble, per cent.	Pounds.	Per cent.			
1	10	639	53·49	17·46	2·62	0·011	532	83·25	64·45	6·37	0·529	0·0010	100	15·64	6·92	68·47	7	1·11	97·56	2·44	1·235
2	20	535	53·49	.. ·6	2·62	0·011	424	79·25	64·24	5·45	0·516	0·0010	101	18·87	5·91	70·72	10	1·88	98·04	1·96	1·225
3	40	648	53·49	17·46	2·62	0·011	504	77·77	67·42	3·70	0·361	0·0004	132	20·37	5·03	67·28	12	1·86	97·93	2·07	1·287

RECAPITULATION FOR SAMPLE No. 3.

Pounds iron in crude, 346·61.	
" concentrate	339·79
" tailings	6·63
" slime	0·19
Totals	346·61

Per cent saved in concentrate	98·03
" lost in tailings	1·89
" lost in slime	0·08
Totals	100 00

Units of crude required per unit of concentrate, 1·30.

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MAGNETIC CONCENTRATION,

2319 POUNDS TO DRY TEST

DRY CONCENTRATION.

		Crude Ore Sized.						Concentrates.						Tailings.				Dust Loss.		Efficiency.		
		Weight and per cent.		Analyses.				Weight and per cent.		Analyses.				Weight and per cent.		Analyses.						
Sample Number	Through Mesh.	Pounds.	Per cent.	Iron, per cent.	Insoluble, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Pounds	Per cent.	Iron, per cent.	Insoluble, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Pounds.	Per cent.	Iron, per cent.	Insoluble, per cent.	Pounds.	Per cent.	Per cent of Iron Saved.	Per cent of Iron Lost.	Units of Crude Per Unit of Concentrate.
1	40	866	37·40	56·21	7·65	2·257	0·004	498	57·50	64·22	3·58	0·375	0·0007	342	39·49	44·60	13·01	26	3·01	68·00	32·00	1·68
2	20	303	13·08	52·79	10·34	3·523	0·011	177	58·41	50·31	7·05	0·840	0·0020	115	37·95	43·10	16·32	11	3·64	67·27	32·73	1·67
3	10	525	22·64	47·51	12·63	3·585	0·012	272	51·81	53·60	10·91	1·360	0·0020	247	47·04	41·62	17·55	6	1·15	58·11	41·89	1·92
4	6	625	26·88	49·10	15·75	2·505	0·007	330	52·80	52·41	11·07	1·240	0·0030	291	46·56	45·42	15·68	4	0·64	56·47	43·53	1·89
Totals....		2,319	100·00	51·87	10·99	2·780	0·007	1,277	55·06	58·10	7·63	0·870	0·0020	[illegible]	42·91	44·92	15·29	47	2·03	59·26	40·74	1·89

RECAPITULATION FOR TOTALS.

Pounds iron in crude, 1,202·86—

" concentrate	741·94
" tailings	446·95
" dust	13·97
Totals	1,202·86

Per cent saved in concentrate	61·68
" lost in tailings	37·15
" lost in dust	1·17
	100·00

Units of crude required per unit of concentrate, 1·81.

FIG. 2

TION, BRISTOL ORE, SHIPMENT No. 2

Units Crude r Unit of oncen- trate.
1·68
1·67
1·92
1·83
1·89

→ POUNDS TO WET TEST 1904

WET CONCENTRATION.

Crude Ore.							Concentrates.						Tailings.				Slime Loss.		Efficiency.		
Sample Number.	Ground to Mesh.	Weight in Pounds.	Analyses.				Weight and per cent.		Analyses.				Weight and per cent.		Analyses.				Per cent of Iron Saved.	Per cent of Iron Lost.	Units of Crude Per Unit of Concentrate.
			Iron, per cent.	Insoluble, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Pounds	Per cent.	Iron, per cent.	Insoluble, per cent.	Sulphur, per cent.	Phosphorus, per cent.	Pounds.	Per cent.	Iron, per cent.	Insoluble, per cent.	Pounds	Per cent.			
1	10	664	51·83	9·97	2·79	0·008	473	71·08	56· 1	8·40	1·12	0·0007	172	25·90	37·41	18·50	20	3·02	81·34	18·66	1·35
2	20	622	51·83	9·97	2·79	0·008	392	63·02	59·99	6·95	0·74	0·0007	199	31·99	38·62	19·39	31	4·99	71·45	28·55	1·62
3	40	618	51·83	9·97	2·79	0·008	346	55·98	61·48	5·96	0·42	0·0003	229	37·05	38·43	20·07	43	6·97	69·36	30·64	1·71

RECAPITULATION FOR SAMPLE No. 3.

Pounds iron in crude, 320·31	
" concentrate	213·92
" tailings	88·00
slime	18·39
Totals	320·31

Per cent saved in concentrate	66·78
" lost in tailings	27·47
" lost in slime	5·75
	100·00

Units of crude required per unit of concentrate, 1·71.

CANADA
DEPARTMENT O
MINES BRANC
Hon. W. Templeman, Minister; A. P. Lo
Eugene Haanel, Ph.D.,

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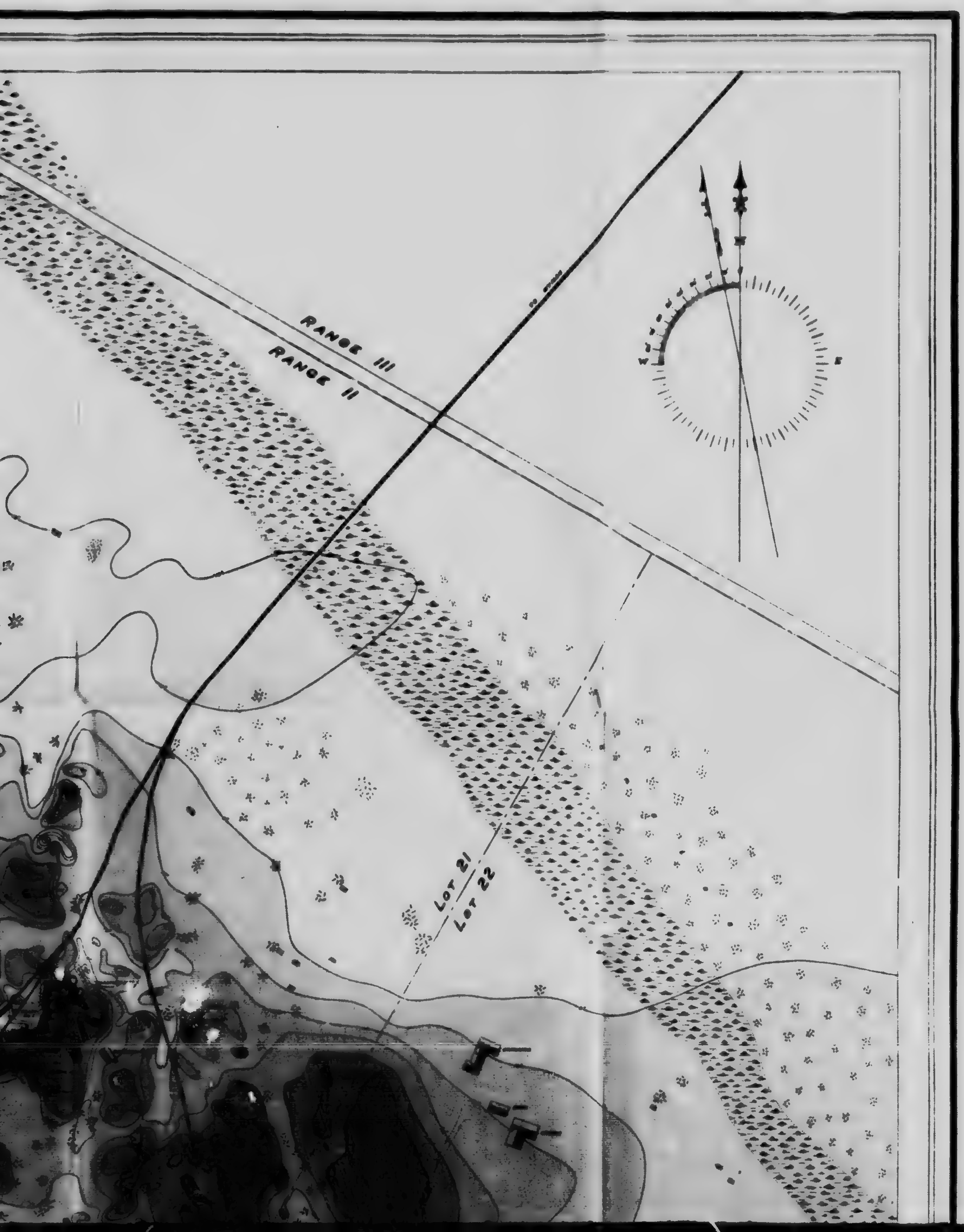
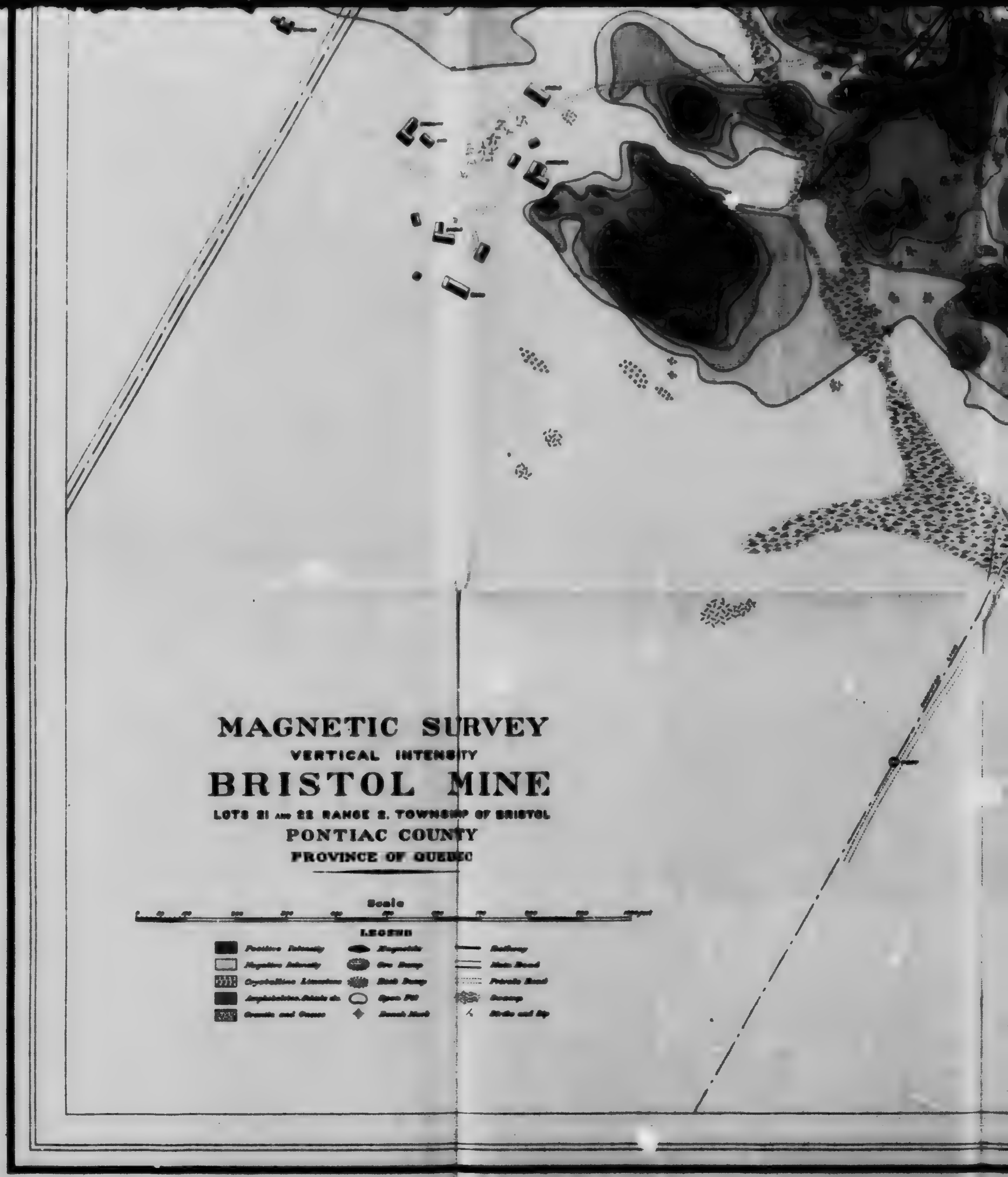
ENT OF MINES
BRANCH
; A. P. Low LL.D., Deputy Minister;
, Ph.D., Director.





MAGNETIC SURVEY

VERTICAL INTENSITY

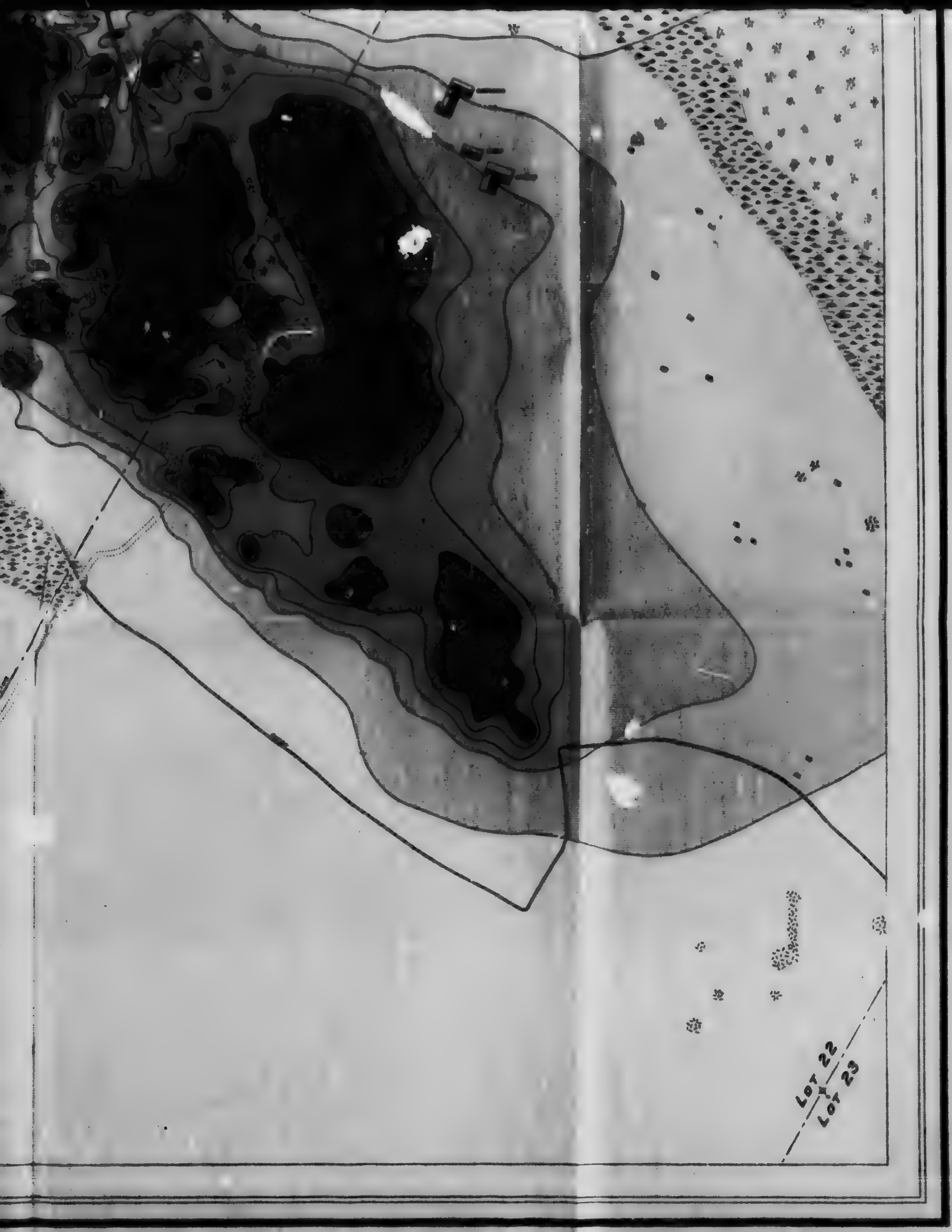
BRISTOL MINE

LOTS 21 AND 22 RANGE 2, TOWNSHIP OF BRISTOL

PONTIAC COUNTY

PROVINCE OF QUEBEC

L.H.S. Pereira, Draughtsman.



Surveyed July-Oct. 1908 by E. Lindeman.

CA
DEPARTME
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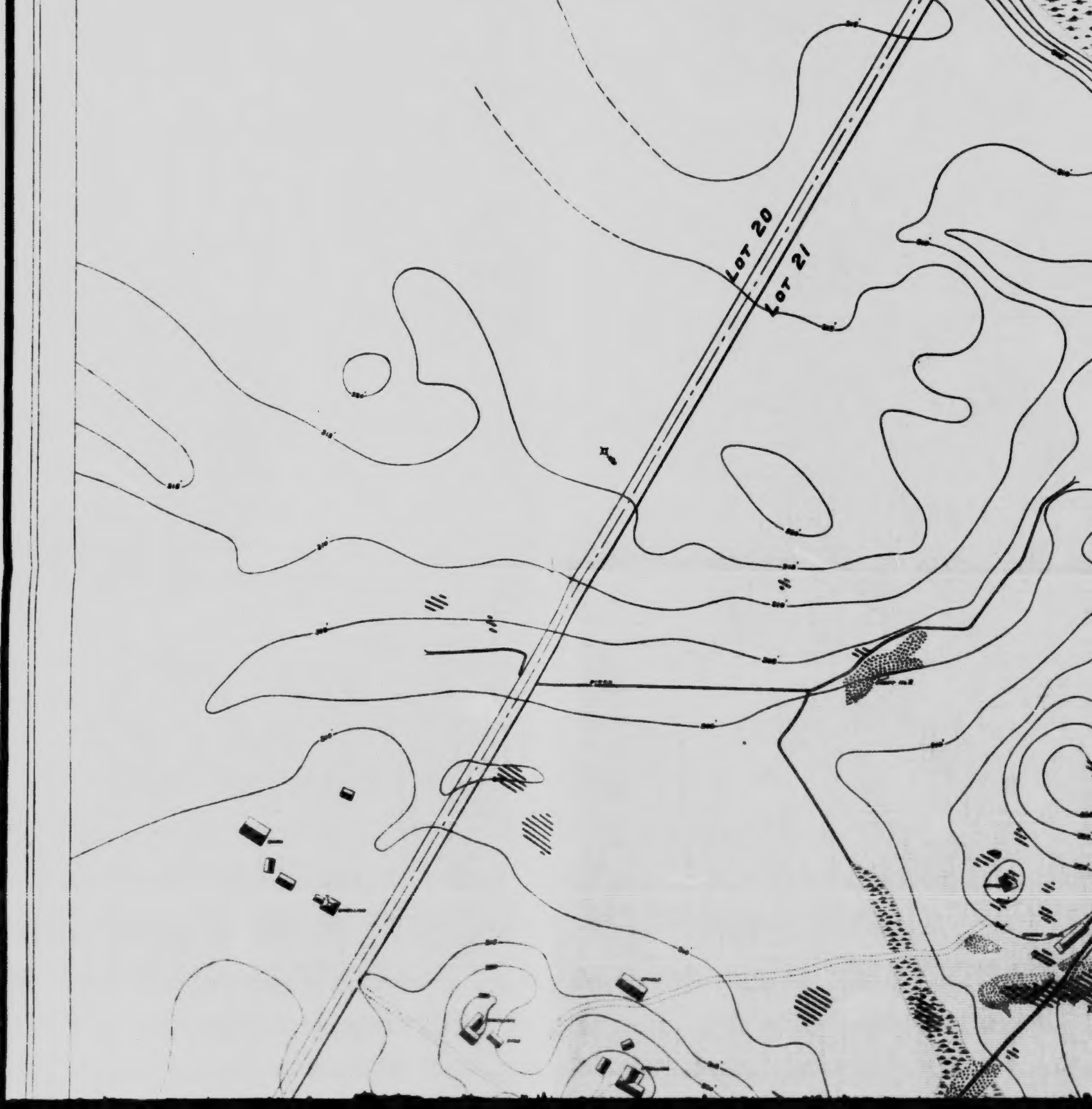
Hon. W. Templeman, Minister
Eugene Haan



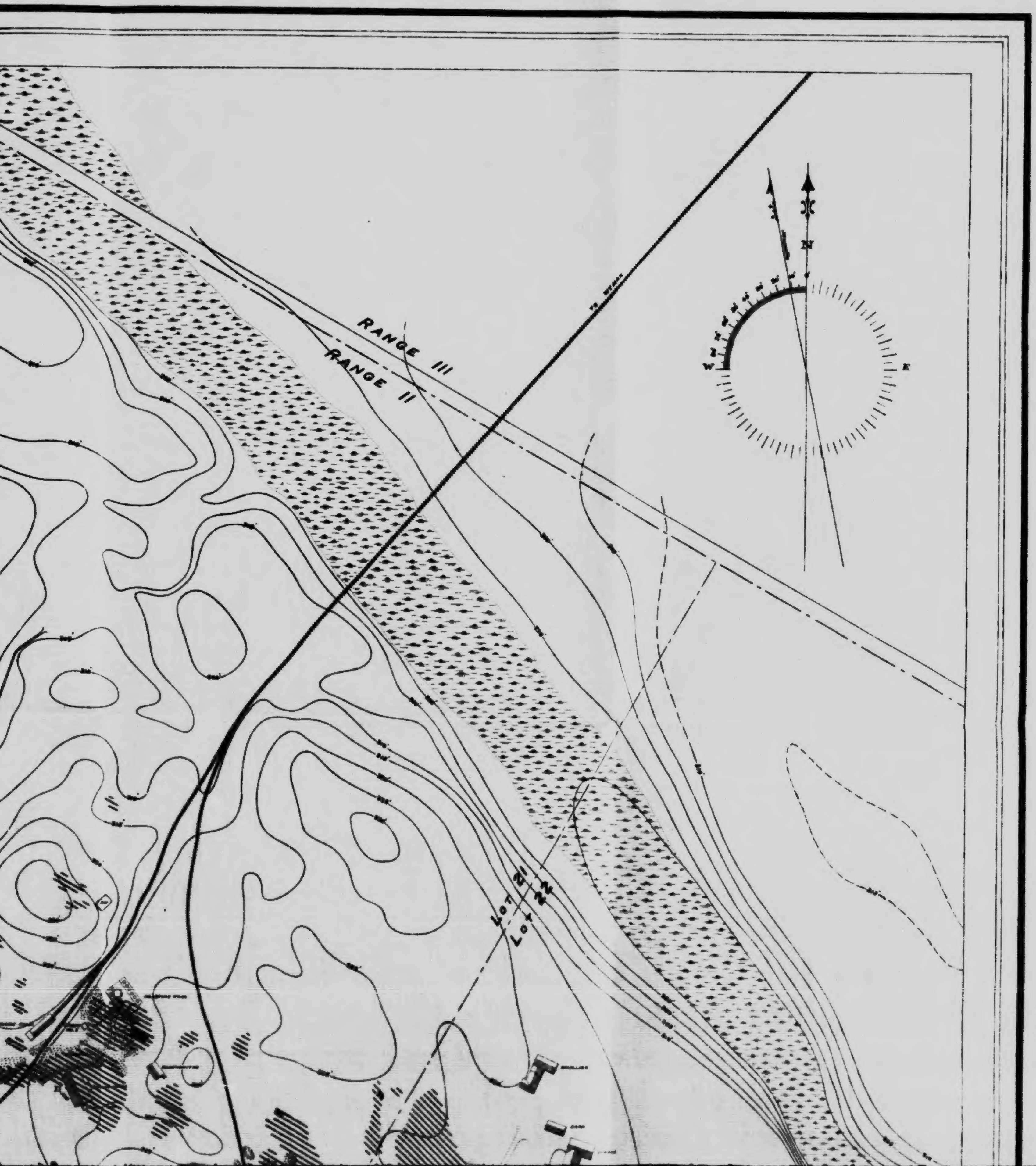
CANADA

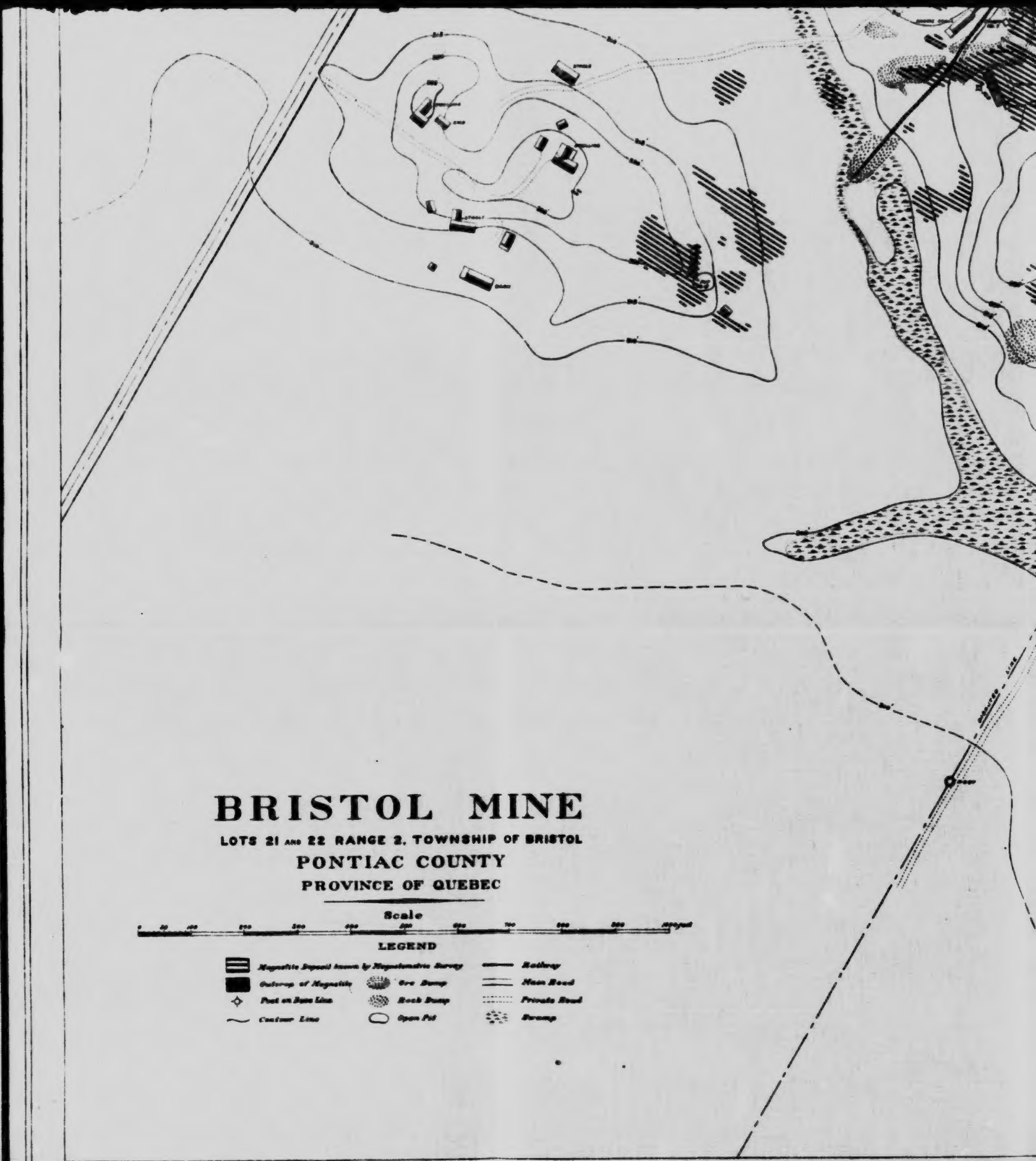
RTMENT OF MINES

MINES BRANCH

Minister; A. P. Low, LL.D., Deputy Minister;

ene Haanel, Ph.D., Director.





BRISTOL MINE

LOTS 21 AND 22 RANGE 2, TOWNSHIP OF BRISTOL

PONTIAC COUNTY

PROVINCE OF QUEBEC

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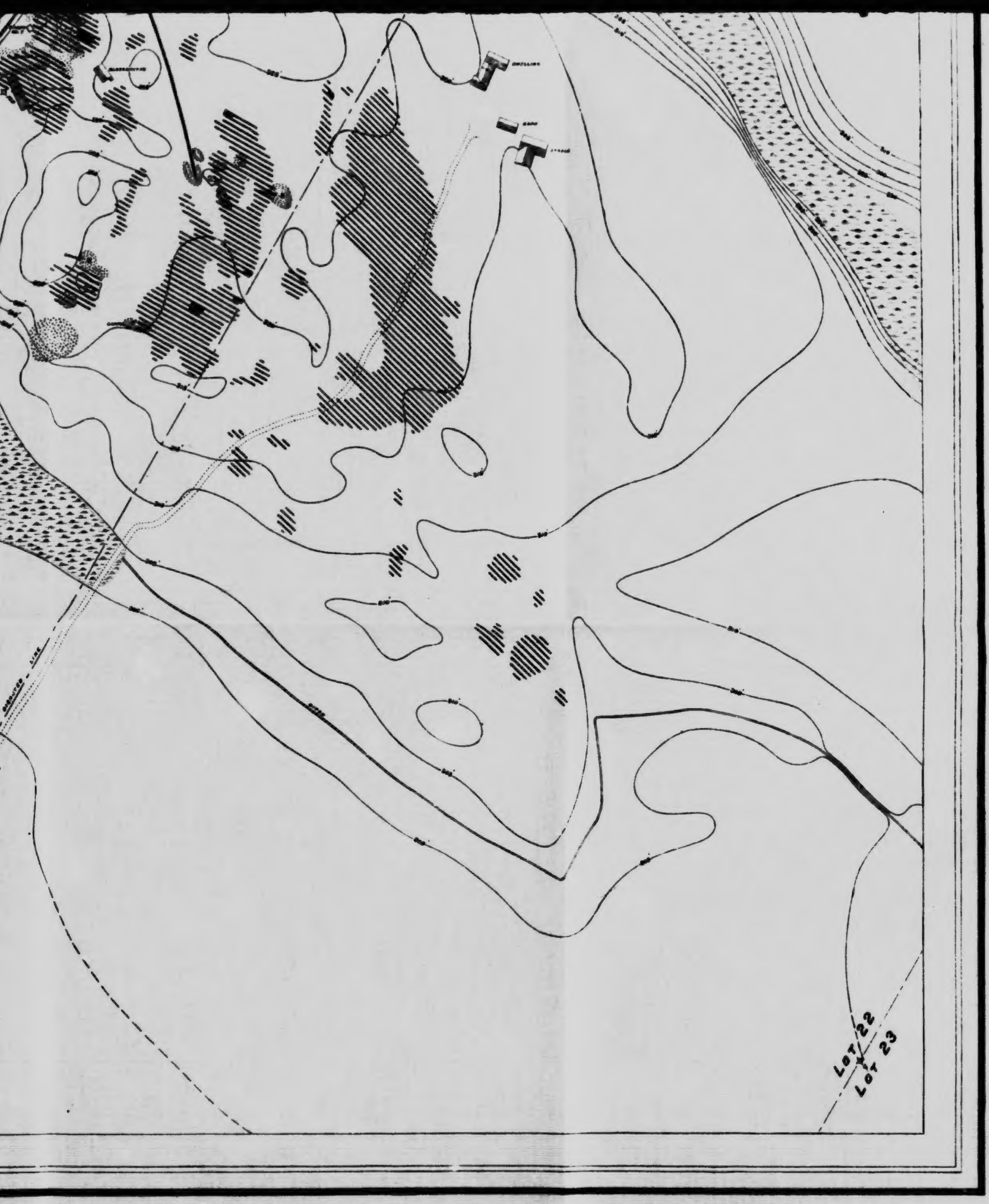

Surveyed July Oct 1909 by E. Lindeman